

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of : **Confirmation No. 7371**  
Dominic WALSH et al. : Attorney Docket No. 2005\_0985A  
Serial No. 10/539,348 : Group Art Unit 1793  
Filed May 2, 2006 : Examiner John A. Hevey

METAL OR METAL OXIDE POROUS  
MATERIAL AND CATALYST,  
PREPARED BY USE OF DEXTRAN OR  
RELATED SOLUBLE CARBOHYDRATE  
POLYMER AS AN AGENT TO  
FORM POROUS THREE-DIMENSIONAL  
ARCHITECTURES FROM METAL  
SALTS OR PREFORMED PARTICLES : **Mail Stop: Appeal Brief-Patents**

**APPEAL BRIEF FILED UNDER 37 CFR § 41.37**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

THE COMMISSIONER IS AUTHORIZED  
TO CHARGE ANY DEFICIENCY IN THE  
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ACCOUNT NO. 23-0975

Sir:

The following is Appellants' Brief, submitted under the provisions of 37 CFR § 41.37. Pursuant to the provisions of 37 CFR § 41.20, this brief is submitted with the required fee of \$540.00.

**I. REAL PARTIES IN INTEREST**

The real parties in interest are JAPAN SCIENCE AND TECHNOLOGY AGENCY and NATIONAL INSTITUTE FOR MATERIALS SCIENCE, the assignees of record, as recorded at Reel 017840 and Frame 0691.

## **II. RELATED APPEALS AND INTERFERENCES**

There are no related prior or pending appeals, interferences or judicial proceedings known to Appellants, Appellants' legal representative, or assignees, which may be related to, directly affect or be directly affected by, or have a bearing on the Board's decision in the pending appeal.

### **III. STATUS OF CLAIMS**

The status of the claims is as follows.

Pending Claims: 34, 35, 37, 38, 40-42 and 47-50

Rejected Claims: 34, 35, 37, 38, 40-42 and 47-50

Cancelled Claims: 1-33, 36, 39 and 43-46

Appealed Claims: 34, 35, 37, 38, 40-42 and 47-50

A complete copy of all of the pending claims is provided in the attached Claims Appendix.

**IV. STATUS OF AMENDMENTS**

An Amendment After Final Rejection was filed on April 15, 2009, amending claim 42. As indicated in item 7 of the Advisory Action, mailed April 30, 2009, this amendment was to be entered for purposes of appeal. Thus, the claims are those set forth in the Amendment After Final Rejection, filed April 15, 2009.

**V. SUMMARY OF CLAIMED SUBJECT MATTER**

A concise explanation of the subject matter defined in the independent claim involved in the appeal is presented below.

Claim 34 is directed to a method for preparing a metal or metal oxide porous material comprising rod-shaped crystals of a metal or metal oxide, which form an open framework architecture, thereby forming a sponge-like material, which comprises:

preparing an aqueous viscous solution of a water-soluble metal salt and dextran;  
allowing said aqueous viscous solution to self-solidify to form a solid; and  
baking said solid.

Support for this claim is found on page 4, lines 10-19, page 6, lines 14-15 and 20-21, page 7, lines 4-7, page 10, lines 5-14, and page 10, line 22 to page 11, line 2 of Appellants' specification.

Claim 35 is directed to a method for preparing a metal or metal oxide porous material comprising rod-shaped crystals of a metal or metal oxide, which form an open framework architecture, thereby forming a sponge-like material, which comprises:

preparing an aqueous viscous solution of at least two kinds of water-soluble metal salts each having different metal elements, and dextran;  
allowing said aqueous viscous solution to self-solidify to form a solid; and  
baking said solid.

Support for this claim is found on page 4, lines 10-19, page 6, lines 14-15 and 20-21, page 7, lines 4-7, page 10, lines 5-14, and page 11, lines 16-22 of Appellants' specification.

**VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

Whether claims 34, 35, 37, 38, 40-42 and 47-50 are unpatentable under 35 U.S.C. § 103(a) over Hoshino et al. (U.S. Patent No. 6,117,592) further in view of Gutjahr et al. (U.S. Patent No. 4,273,582) and Jones et al. (U.S. Patent No. 4,937,210).

## VII. ARGUMENT

The rejection of claims 34, 35, 37, 38, 40-42 and 47-50 under 35 U.S.C. § 103(a) as being unpatentable over Hoshino et al. (U.S. Patent No. 6,117,592) further in view of Gutjahr et al. (U.S. Patent No. 4,273,582) and Jones et al. (U.S. Patent No. 4,937,210) is respectfully traversed.

### The Position of the Examiner

The position of the Examiner, as described in the final Office Action of April 15, 2009, is set forth below.

The Examiner takes the position that Hoshino et al. teach a method of making a porous metallic material comprising steps for forming an aqueous mixture of one or more metal powders, an organic solvent, a water-soluble resin binder, a plasticizer and water, and steps for forming a molded product, burning and sintering. The Examiner admits that Hoshino et al. fail to teach a water-soluble metal salt, and fail to teach dextran.

The Examiner asserts that Gutjahr et al. teach a method of making a porous metal sintered body comprising forming a mixture of one or more metal powders in elemental or soluble salt form. The Examiner takes the position that it would have been obvious to one of ordinary skill in the art to modify the teachings of Hoshino et al. to select a metal powder comprising a soluble metal salt as taught by Gutjahr et al., in order to enhance the quality of the porous body.

The Examiner further asserts that Jones et al. teach a method of making porous inorganic bodies, and teach the use of viscosifying agents, such as polyvinyl alcohol, dextran, starch, and hydroxyethylcellulose. The Examiner takes the position that one of ordinary skill in the art would appreciate that the resin binder compounds taught by Hoshino et al. and the viscosifying agents taught by Jones et al. are substitutes, as they comprise many of the same compounds and serve substantially the same purpose. Thus, the Examiner asserts that it would have been obvious to one of ordinary skill in the art to substitute the binder of Hoshino et al. (e.g., PVA) with dextran, as taught by Jones, in order to enhance the formation of a porous body.



*Appellants' Arguments*

Appellants respectfully disagree with the Examiner's position for the following reasons.

The present invention uses a water-soluble metal salt and dextran to form an aqueous viscous solution. The use of a water-soluble metal salt enables the formation of a metal or metal oxide porous material with a homogenous porous structure, because the salt homogeneously dissolves in the aqueous viscous solution. On the contrary, the prior art uses metal powders or metal oxide powders as raw materials which form inhomogeneous porous structures.

In addition, the use of dextran enables the preparation at room temperature of a solid which can then be baked. This reduces production costs and makes the production process much simpler. The prior art uses cellulose derivatives, such as starch, etc., and does not disclose or suggest the use of dextran. The use of cellulose derivatives disclosed in the prior art require heating to form the solid that is formed before baking, due to the poor solubility of cellulose derivatives in water. This complicates the process and drives up the cost.

The present invention also provides a method for preparing a homogenous porous material even when two or more types of water-soluble metal salts are used. This is possible because the metal salts dissolve homogeneously in the aqueous viscous solution, much the same as the case when using one kind of water-soluble metal salt. Furthermore, additives such as plasticizers, organic solvents, etc., are not required by the present invention.

Hoshino et al. disclose a method of making porous metallic metal powders. The Hoshino et al. method includes forming an aqueous mixture of one or more metal powders from an organic solvent and a water-soluble resin binder. The water-soluble resin binder is selected from methyl cellulose, hydroxypropylmethyl cellulose, hydroxyethylmethyl cellulose, carboxymethyl cellulose ammonium, ethyl cellulose, and polyvinyl alcohol. The Hoshino et al. method also uses a plasticizer and water, and includes the steps of forming a molded product, burning, and sintering. Nickel, copper,

silver, gold, etc., are exemplified as the metal powders.

However, as admitted by the Examiner, the metal powder in Hoshino et al. is not soluble in water. Therefore, the metal powder cannot be mixed and dispersed homogenously in the molded product. Moreover, the use of a water-soluble resin binder, as discussed above, requires heating in order to impart water-solubility for gelation. This requires additional processing and higher cost. Hoshino et al. also use additives such as plasticizers, and organic solvents. In particular, Hoshino et al. use hydrocarbon organic solvents and surfactants for foaming. As discussed above, the present invention does not use such additives.

The Examiner admits that Hoshino et al. fail to teach a water-soluble metal salt and dextran, both of which are required by Appellants' claims. The Examiner relies on two secondary references, in an attempt to render Appellants' claims obvious. However, the secondary references (Gutjahr et al. and Jones et al.) are entirely different from the present invention.

Gutjahr et al. use a volatile grained metal salt (e.g., NaCl) to form (i.e., to fill) the corresponding porous shape. The grained metal salt is not used as a synthetic raw material. (Please see columns 1-3 and the Examples of the reference.) In fact, the metal salt (e.g., NaCl) is removed by vaporization at vacuum condition during the sintering process of the metal (e.g., nickel). (Please see column 1, line 58 to column 2, line 2 of the reference.) On the contrary, the present invention uses a water-soluble metal salt as a synthetic raw material in the process of making the porous material. This is clearly recited in Appellants' independent claims 34 and 35.

Thus, the role of the volatile grained metal salt of Gutjahr et al. is entirely different from the water-soluble metal salt of the present invention, i.e., as a synthetic raw material in the process of making the porous material. The volatile grained metal salt of Gutjahr et al. is merely mixed with a powder of nickel, etc. as a synthetic raw material, and is not solubilized with water. This is in sharp contrast to Appellants' claimed process, wherein the first step of the method is to prepare an aqueous viscous solution of a water-soluble metal salt and dextran.

Appellants respectfully assert that one of ordinary skill in the art would not have looked to the teachings of Gutjahr et al. from the teachings of Hoshino et al., absent the direction of Appellants' disclosure. Thus, any assertion that one of ordinary skill in the art would have made these changes can only be based on hindsight, after reading the teachings of Appellants' disclosure. As stated by the Supreme Court in KSR International Co. v. Teleflex Inc., "the factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning." (See KSR International Co. v. Teleflex Inc., 237 S. Ct. 1727 (U.S. 2007), referring to Graham v. John Deere Co. of Kansas City, 86 S. Ct. 684, which warned against a "temptation to read into the prior art the teachings of the invention in issue" and instructing courts to "guard against slipping into the use of hindsight". Thus, for this reason alone, the rejection is untenable.

Additionally, the Examiner takes the position that one would merely "substitute" the soluble metal salt of Gutjahr et al. for the metal powder of Hoshino et al. As stated in MPEP 2141, in the Examination Guidelines for Determining Obviousness Under 35 U.S.C. § 103(a), the key to supporting any rejection under 35 U.S.C. § 103(a) is the clear articulation of the reasons why the claimed invention would have been obvious.

In the present case, the Examiner appears to be relying on the rationale that the simple substitution of one known element for another would provide predictable results. MPEP 2143 provides a more detailed discussion, stating that in order to reject a claim based on this rationale, the Examiner must resolve the *Graham* factual inquiries, and *then* provide the following:

(1) a finding that the prior art contained a device (method, product, etc.) which differed from the claimed device by the substitution of some components (step, element, etc.) with other components;

(2) a finding that the substituted components and their functions were known in the art;

(3) a finding that one of ordinary skill in the art could have substituted one known element for another, and the results of the substitution would have been predictable; and

(4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

Additionally, the MPEP states that the rationale to support a conclusion that the claim would have been obvious is that the substitution of one known element for another yields predictable results to one of ordinary skill in the art. If any of these findings cannot be made, then this rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art.

In the current case, the Examiner has not provided evidence that the substitution of the water soluble salt of Gutjahr et al. for the metal powder of Hoshino et al. would yield predictable results. Furthermore, as discussed above, the purpose of the water soluble salt of Gutjahr et al. is quite different from the present invention, and from Hoshino et al., thus further implying that the substitution suggested by the Examiner would not yield predictable results. Thus, according to MPEP 2143, the Examiner's rationale for obviousness is inappropriate.

Accordingly, Gutjahr et al. fail to remedy the deficiencies of Hoshino et al., because Gutjahr et al. fail to teach or suggest the step of preparing an aqueous viscous solution of water-soluble metal salt and dextran, as required by Appellants' claims. Furthermore, the teachings of Gutjahr et al. do not provide any motivation for including dextran as a binder in the mixture subjected to sintering, because it is used for a battery electrode, and thus the required shape of the product is relatively arbitrary.

As discussed above, the Examiner relies on the Jones et al. reference as teaching dextran. However, the Jones et al. reference is related to a production method of hollow microspheres (particulates) by spray drying a dispersion of aluminosilicate material. Accordingly, the object of using dextran is entirely different in Jones et al., since the reference exemplifies dextran as a viscosifying agent (e.g., column 3, lines 51-60) for making "a particulate". That is, dextran is used in Jones et al. to adjust the dispersion for spray drying treatment, which contains aluminosilicate material of a high specific gravity. The viscosifying agent of Jones et al. does not work to form a sponge-like structure, as in

the present invention, nor does the viscosifying agent directly contribute to the forming of the hollow structure. Further, the porous material of Jones et al. is different, as the reference produces a hollow microsphere, while the present invention produces a bulk sponge-like material.

Similar to the discussion above regarding Gutjahr et al., Appellants respectfully assert that one would not have looked to the teachings of Jones et al., without the direction of Appellants' specification. Additionally, there is no discussion as to why the asserted substitution would achieve predictable results.

Thus, although Hoshino et al. teach a method of making a porous metallic metal powder comprising the steps of forming an aqueous mixture of one or more metal powders, an organic solvent, a water-soluble resin binder, a plasticizer, and water, and the steps of forming a molded product, burning, and sintering, the metal powder of Hoshino et al. is not soluble in water. (This is acknowledged by the Examiner.) Therefore, it is difficult to mix and disperse the metal powder homogeneously in the molded product.

Further, as also acknowledged by the Examiner, Hoshino et al. fail to teach or suggest the use of dextran. Although Hoshino et al. use additives such as a plasticizer, an organic solvent, and surfactants, these are used for the purpose of foaming which contribute to the formation of pore structure in the product, which is entirely different from the present invention.

For the reasons discussed above, one of ordinary skill in the art would not have looked to either of the secondary references to remedy the deficiencies of Hoshino et al. Thus, the subject matter of Appellants' claims is patentable over the cited combination of references, and the above-rejection should be withdrawn.

Conclusion

For the foregoing reasons, the invention of claims 34, 35, 37, 38, 40-42 and 47-50 is patentable over the combination of references relied upon by the Examiner. Thus, reversal of the final rejection is respectfully requested.

Attached hereto are a Claims Appendix, an Evidence Appendix and a Related Proceedings Appendix.

The brief is submitted with the required fee.

Respectfully submitted,

Dominic WALSH et al.

/Amy E. Schmid/

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## **VIII. CLAIMS APPENDIX**

### **1 – 33. (Canceled)**

**34. (Appealed)** A method for preparing a metal or metal oxide porous material comprising rod-shaped crystals of a metal or metal oxide, which form an open framework architecture, thereby forming a sponge-like material, which comprises:

- preparing an aqueous viscous solution of a water-soluble metal salt and dextran;
- allowing said aqueous viscous solution to self-solidify to form a solid; and
- baking said solid.

**35. (Appealed)** A method for preparing a metal or metal oxide porous material comprising rod-shaped crystals of a metal or metal oxide, which form an open framework architecture, thereby forming a sponge-like material, which comprises:

- preparing an aqueous viscous solution of at least two kinds of water-soluble metal salts each having different metal elements, and dextran;
- allowing said aqueous viscous solution to self-solidify to form a solid; and
- baking said solid.

### **36. (Canceled)**

**37. (Appealed)** The method according to claim 34, wherein the baking process is carried out at a temperature of not less than 500°C.

**38. (Appealed)** The method according to claim 37, wherein the baking process is carried out at a temperature in a range from not less than 500°C up to 900°C.

### **39. (Canceled)**

**40. (Appealed)** The method according to claim 34, wherein dextran in the aqueous viscous solution has a concentration in the range of 10 to 80% by weight and the water-soluble metal salt has a concentration in the range of 10 to 90% by weight.

**41. (Appealed)** The method according to claim 40, wherein the water-soluble-metal salt has a concentration in the range of 15 to 60% by weight.

**42. (Appealed)** The method according to claim 34, wherein dextran in the aqueous viscous solution has a molecular weight in the range of 10,000 to 500,000.

**43 - 46. (Canceled)**

**47. (Appealed)** The method according to claim 34, wherein the metal or metal oxide porous material is a soft or hard sponge-like material.

**48. (Appealed)** The method according to claim 34, wherein the cross-sectional width of the rod-shaped crystal, taken in a direction perpendicular to the length, is from 1  $\mu\text{m}$  to 50  $\mu\text{m}$ .

**49. (Appealed)** The method according to claim 34, wherein the metal element of the water-soluble metal salt is selected from the group consisting of noble metals and transition metals.

**50. (Appealed)** The method according to claim 49, wherein the noble metal is silver or gold.



**IX. EVIDENCE APPENDIX**

None

**X. RELATED PROCEEDINGS APPENDIX**

None